Space Weather Technical Forecast

Issued on Thursday, 09 June 2022 at 01:30 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant space weather activity is expected.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Very Low over the past 24 hours, with no significant flares. There is currently one unnumbered sunspot region which has recently emerged near the central meridian in the southern hemisphere, which is a small and simple Axx/Alpha configuration. There also appears to be a potential new region rotating onto the southeast limb, with a further potential new region nearing the northeast limb. It is too early as yet to assess either of these regions.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1 has been at ambient levels, ranging between 300 to 340km/s. Density has been average or just above average. The Interplanetary Magnetic Field, Bt, has been mainly weak, though did briefly become moderate reaching 10 nT at 08/0636 UTC. The north-south component, Bz, ranged between +6/-7nT, and has been predominantly southward directed. The phi angle has been predominately in a negative (towards the Sun) orientation. Geomagnetic activity was Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at Background levels.

Electron flux was at predominantly background levels. Electron fluence was below the Active (1e8 integrated pfu) threshold on a downward trend, with 1.33e6 integrated pfu recorded at 09/0000 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Very Low initially. Returning active regions may increase the risk of flares through the period, although the degree to which this occurs is uncertain until these regions can be seen on the visible disc.

Solar Wind / Geomagnetic Activity: The solar wind is currently at background levels. There are three non-persistent, small and weak coronal holes on the visible disk. Positive CH87 could give faster winds to around 450 km/s on Day 2 (10 June). The proximity of the Solstice means that any geomagnetic response from positive coronal holes at this time of year is likely to be muted.

As such, geomagnetic activity is expected to be mostly Quiet through this period. However, there is a risk of Unsettled to Active (Kp3-4) intervals early on Day 2 (10 June) if we see any high speed stream effects from CH87.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10 MeV) is expected to be at Background levels during this period.

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High energy electron flux (greater than 2 MeV) is expected to vary between Normal Background and perhaps Moderate levels. Electron fluence is expected to remain below the Active threshold throughout, although with just a slight chance of a recovery in fluence levels.

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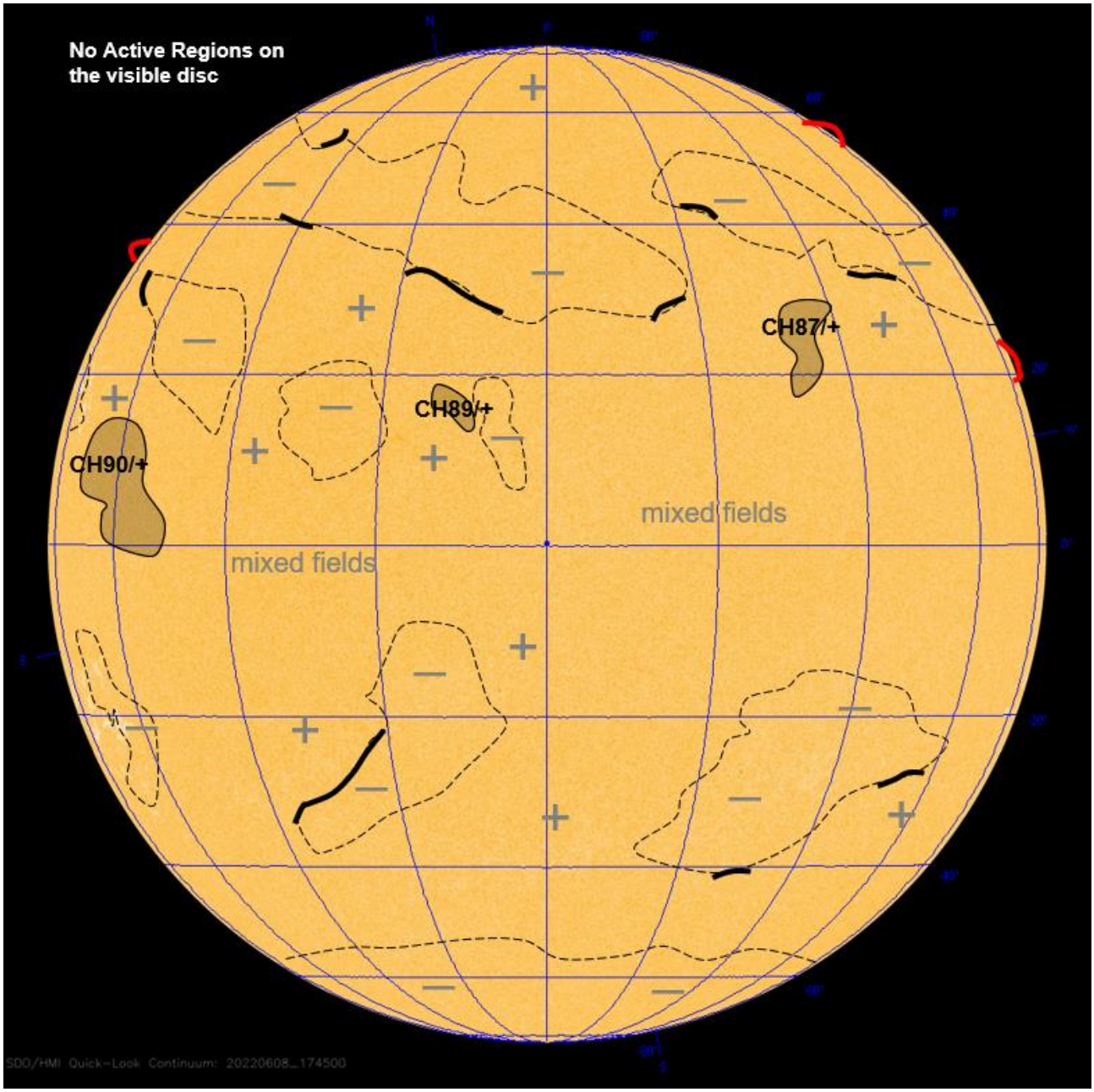
Figure 1. Solar Analysis Valid 08/1745UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

The solar wind is currently at background levels.

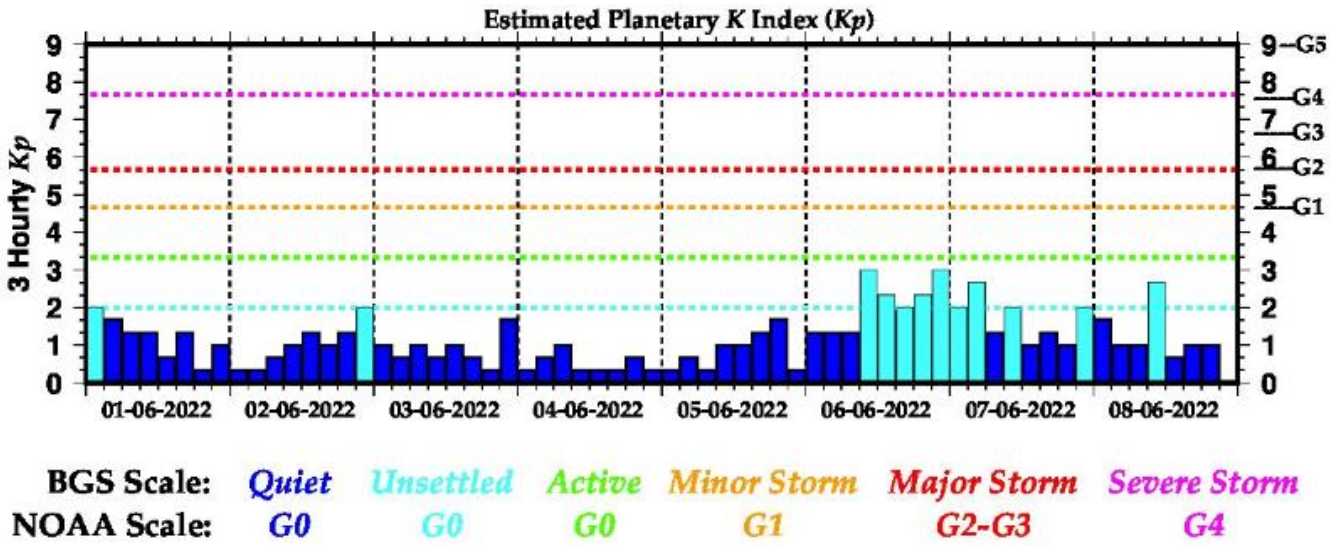
Non-persistent, small and weak coronal hole CH87/+ may give a weak high speed stream on Day 2 (10 June). However, this CH is very small and unlikely to have a significant effect with wind speeds not expected to reach much above 450 km/s. In addition, the proximity of the Solstice means that any geomagnetic response from positive coronal holes at this time of year is likely to be muted. STEREO-A MAG and PLASTIC data appears not to have updated since approximately 06/1230 UTC, so is not currently providing helpful guidance.

As such, geomagnetic activity is expected to be mostly Quiet through this period. However, there is a risk of Unsettled to Active (Kp3-4) intervals early on Day 2 (10 June) if we see any high speed stream effects from CH87.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections – Nil.

Figure 2: BGS Kp has been Quiet (kp 0-2) since early on the 7th.



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Radio Blackouts - X-Ray Flares:
There are currently only one unnumbered, small and simple sunspot region, which has recently emerged in the southern hemisphere. However, STEREO-A EUVI-195 imagery does hint at possible returning region(s) near the east limb. This is the rationale for the slight uptick in the risk of M-class flares in the forecast period, although this is effectively a placeholder as any returning region(s) cannot be analysed until they become fully visible after rotating onto the visible disc.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	2	5	5	10
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):
The high energy proton flux (greater than 10 MeV) is at background levels. It is expected to remain at this level through the period in the absence of significant sunspot regions in the western hemisphere.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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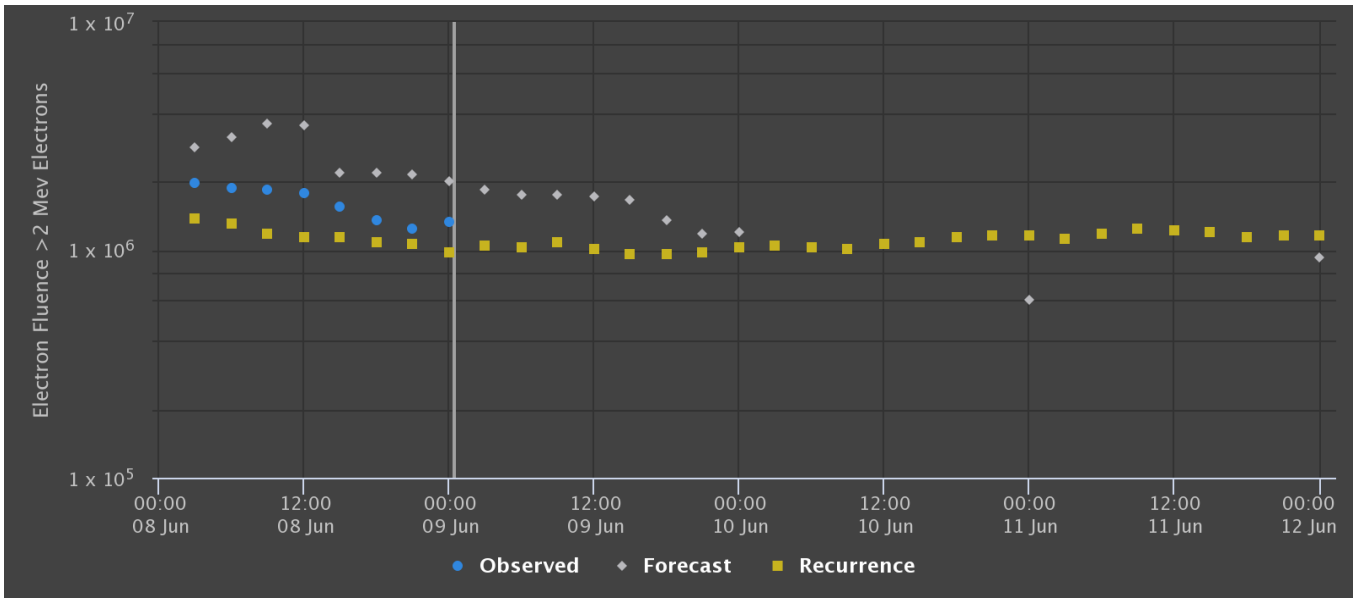
High Energy Electrons Event (≥ 2MeV):
High energy electron flux (greater than 2MeV) has been at mostly background levels through the last two days. As there are no large coronal holes on the disc at present, charging is considered unlikely in this period.

Therefore, electron fluence is expected to stay below the Active threshold through to at least Day 3 (11 June). REFM is currently forecasting fluence to remain below the Active threshold, which is considered good guidance.

GEO Electron Environment	Level ($cm^{-2}\,sr^{-1}\,day^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	5	10	10
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 3: REFM observations and forecast.



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